

Site OE-24E

Practice Rifle Grenade Range

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SITE OE-24E (PRACTICE RIFLE GRENADE RANGE)

3.24E Site OE-24E (Practice Rifle Grenade Range)

This summary report consists of two parts. The first part, contained in Sections 3.24E.1 through 3.24E.5, includes a presentation and assessment of archival data. Specific elements include a review of site history and development, evaluation of potential ordnance at the site, a summary of previous ordnance and explosives (OE) investigations, and a conceptual site model. The above-mentioned information was used to support the second part of this report, which is the Site Evaluation (Section 3.24E.6). The Site Evaluation was conducted in accordance with procedures described in the *Final Plan for Evaluation of Previous Work (HLA, 2000)* and may restate some information presented previously. The Site Evaluation discusses the evaluation of the literature review process (Section 3.24E.6.1), and evaluation of sampling process(es) (Section 3.24E.6.2). These discussions are based on information from standardized literature review and sampling review checklists (Attachment 24E-A1). Section 3.24E.7 provides conclusions and recommendations for the site. References are provided in Section 3.24E.8.

3.24E.1 Site Description

Site OE-24E is 2.7 acres in size and located in the west-central portion of the former Fort Ord to the south of the Main Garrison and just north of the Multi-Range Area (MRA) and within the Fitch Park military housing complex (Plate 24E-1). Site OE-24E was identified as a site in the Fort Ord Archive Search Report (ASR) Supplement No. 1 (*U.S. Army Engineer Division, Huntsville [USAEDH], 1994*).

3.24E.2 Site History and Development

The following presents a summary of the site history and development that is based on archival research and review of historical training maps and aerial photographs. Plates have been prepared that present pertinent features digitized from historical training maps and scanned aerial photographs reviewed by MACTEC. It should be noted that minor discrepancies between source maps, combined with the natural degradation of older source maps and photographs, has resulted in misalignment of some map features. In addition, camera angle and lens distortion introduced into older aerial photographs, combined with changes in vegetation and site features over time may contribute to misalignments of some map features with respect to the aerial photographs.

1940s Era

This site lies within a tract of land purchased from private landowners by the government after July 1940 (*Arthur D. Little, Inc. [ADL], 1994*). Review of 1940s era documentation including historical maps and aerial photographs indicates a Practice Rifle Grenade training area was present in this area (Plate 24E-2).

- A Practice Rifle Grenade training area is shown on 1945 and 1946 training maps (*U.S. Army [Army], 1945a, 1946*). Located nearby is a Booby Trap training area (Site OE-24D). Live Grenade (OE-24C) and Practice Grenade (OE-24B) training areas are also shown in the vicinity of the Practice Rifle Grenade training area (Plate 24E-2).
- Cleared/disturbed areas are visible on aerial photos from 1949 and 1951 in the vicinity of the Practice Rifle Grenade training area.

1950s Era

Review of 1950s era documentation including training maps, aerial photographs, and grading plans indicates that practice rifle grenade training ended sometime prior to 1954 and that the area was developed as base housing by 1959. The following identifies the results of the historical map and aerial photograph review:

- Cleared/disturbed areas are visible on aerial photos from 1951 and 1956 in the vicinity of the Practice Rifle Grenade training area (Plate OE-24E-2).
- The Practice Rifle Grenade (OE-24E) is not shown on the 1954 map or on maps post 1954 maps (*Army, 1954*).
- The 1956 training map shows a “SQ Pat Area” (squad patrol area) covering the site area (*Army, 1956*).
- Grading plans dated 1957 are available for this area and show the planned development of this area for the East Officers Housing Area. Plans show as-built revisions dated 1959 (*U.S. Army Corps of Engineers [USACE], 1959*).
- Aerial photographs from 1959 (*USACE, 1960*) show the completed housing. It appears the areas cleared of vegetation in the 1949 aerial photograph were covered with housing or fill material in 1959.

1960s To Present

Military housing was completed in 1959 and was occupied from the 1960s to present (*USACE, 1959*). The closest training areas used from the 1960s until present are south of the site inside the MRA.

- No training areas are present in this area on training maps from 1964 through 1988.
- Aerial photographs from 1966 (Plate 24E-3) and 1999 (Plate 24E-4) show continued housing over the former site area. The housing is identified as Rogers Fitch Park on a 1967 map (*Army, 1967*).
- Two practice 40mm projectiles were discovered northeast of the site at the northern edge of the housing area in August 1997. The 40mm practice projectiles were not available for use in the 1940s. This type of ordnance was used in the MRA after the 1960s.

Proposed Future Land Use

The proposed reuse of this area is continued military housing.

3.24E.3 Potential Ordnance based on Historical Use of the Area

This section describes the types of training devices that could have been used for practice rifle grenade training in the 1940s. Information concerning the types of items that could have been used was obtained from technical manuals (*Army, 1977*) and the American Arsenal (*Hogg, 2001*) and is summarized below.

3.24E.3.1 Practice Rifle Grenades

Rifle grenades are designed for fire from U.S. rifles and carbines by a launcher that is attached to the gun muzzle. A special blank cartridge, issued with the grenade is required to complete the launching. The M11A2 antitank practice grenade was available for use during World War II. This item was an inert loaded dummy grenade similar in shape and weight to the M9A1 high explosive antitank grenade. No explosive charge was associated with this practice item. The M11A1 differed from the M9A1 in that the fins could be replaced in case they were damaged or wore out. Because this was a practice rifle grenade training area it is not expected that the high explosive M9A1 would have been fired in this area.

3.24E.3.2 Rifle Grenades, Smoke

The grenade launcher attached to the rifle also allowed for fire of smoke rifle grenades, and parachute and cluster ground signals. The M20, M22, and M23 series smoke rifle grenades were available for use during World War II. Ground signals, models M17A1 through M22A1, were also available for fire from the rifle grenade launcher during World War II. It is unknown whether training with smoke-producing items occurred in this area. Practice rifle grenade training would have been conducted during daylight hours and therefore, the use of rifle fired illumination signals is not expected to have occurred at Site OE-24E (*Smith, 2003*).

3.24E.4 History of OE Investigations

The following describes the OE investigations that have been conducted at Site OE-24E.

1994 Archives Search Report Supplement No. 1

The purpose of the archives search conducted at Fort Ord was to gather and review historical information to determine the types of munitions used at the site, identify possible disposal areas, identify unknown training areas and recommend follow-up actions. The archives search was conducted in accordance with the Scope of Work provided to the St. Louis Corps of Engineers by the Huntsville Corps of Engineers, and U.S. Army Corps of Engineers guidance published in June 1994. The archives search included a Preliminary Assessment/Site Inspection (PA/SI) consisting of interviews with individuals familiar with the sites, visits to previously established sites, reconnaissance of newly identified training areas, and the review of data collected during sampling or removal actions.

Site 24 was identified as a new site as part of the November 1994 ASR (*USADEH, 1994*). This site is described as containing several rifle and hand grenade ranges (both practice and live) based on a review of a 1946 map. A site visit was conducted and a piece of warhead was found within Site OE-24A, located just north of Eucalyptus Road. The warhead was believed to be part of high explosive grenade. Sampling was proposed in the ASR for the 10-acre area surrounding the OE item found.

UXB International Investigation

UXB International, Inc. (UXB) completed land surveying of the sites and may have performed some brush cutting within the site boundaries (*UXB, 1995*). No geophysical investigations or intrusive activities were completed. The land surveyed site boundaries are presented on Plate 24E-4. No OE finds are documented in the land surveying report (*UXB, 1995*).

USA Environmental (USA/CMS) Investigation

Sampling of Site OE-24E was completed in 1997 by CMS Environmental, Inc. (CMS) later known as (*USA Environmental Inc. [USA], 2000*). Three sample grids were sampled using the SiteStats/GridStats (SS/GS) sampling program (total of 12,500 square feet) (Table 24E-1). One of the three sample grids was established outside of the site boundary and each of the three grids was of non-standard dimensions due to the presence of terrain and structures within the site. According to the CMS workplan the area was surveyed using a maximum search lane width of 5 feet with a Schonstedt Model GA-52/Cx magnetometer. Following the survey, anomalies were selected for sampling following SS/GS procedures. A total of 434 anomalies were identified and 160 anomalies (37 percent) were excavated to a maximum depth of 4 feet. One OE scrap item (frag) was found at a depth of 4 inches during sampling (Table 24E-2). Other items found include nails, wires, rocks, magnets, and a spoon. The depths of the items ranged from 2 to 16 inches. On the basis of the sampling results, no further OE response was recommended in the after action report (*USA, 2000*).

3.24E.5 Conceptual Site Model

Conceptual site models (CSMs) are generally developed during the preliminary site characterization phase of work to provide a basis for the sampling design and identification of potential release (functioning of the OE item; e.g., detonation) and exposure routes. The CSM presented here is based on historical information and OE investigations completed to date. It is provided to help evaluate the adequacy of the investigations completed to date and to identify potential release and exposure pathways. CSMs usually incorporate information regarding the physical features and limits of the area of concern (the site), the nature and source of the contamination (in this case OE), and exposure routes (potential scenarios that may result in contact with OE).

The CSM for Site OE-24E is based on currently available site-specific and general information including a literature review, review of aerial photographs, training maps, sampling results, field observations, and technical manuals. Plate 24E-5 presents a conceptual site model.

3.24E.5.1 Training Practices

Training practices are discussed below to provide information on the types of OE that may have been used at the site and the possible location of OE potentially remaining at the site.

Practice Rifle Grenade Training

Range configuration information for practice rifle grenade training was obtained from *Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat (Army, 1983)*. Technical information for rifle grenades was obtained from TM 43-0001-29 (*Army, 1994*). Information on World War II Grenade launchers was obtained from the American Arsenal (*Hogg, 2001*). According to the 1983 policies and procedures manual, live rifle grenades will be fired behind a protective barrier equivalent to a screen of sandbags 0.5 meter thick or reinforced concrete walls 0.16 meter thick. It is suspected that sandbags would be used in a practice training area. The maximum danger radius for the high explosive rifle grenade is 200 meters. The maximum range of the practice rifle grenade M29 (model described in TM 43-0001-29) is 150 meters. It is therefore expected that the training area used would be at least 150 meters in length. According to information in the American Arsenal the depth to which the launcher is inserted into the rifle stabilizer tube determines the range attained by the fired grenade. Therefore, it is expected that targets would be placed at various distances to practice firing at different

ranges. Because the practice rifle grenades are inert, no OE associated with this practice rifle grenade training, other than possible blanks used to fire the rifle grenade, would be expected.

Rifle Grenades, Smoke

General information on the use of pyrotechnic items, including smoke grenades, was obtained from Army Field Manual 21-60, (*Army, 1987*). Pyrotechnics are generally used for signaling and ground smoke. The M23A1 is used only for signaling. The M22 and M22A2 can be used for both signaling and laying of smoke screens. It is unknown whether this area was used for practicing of signaling or laying of smoke screens.

3.24E.5.2 Site Features

This area is primarily oak woodland with 2 cleared areas in the vicinity of the site. The partly cleared areas are about 300 by 500 feet (to the east of the current site boundaries) and about 300 by 500 feet (to the south of the current site boundaries) (Plate 24E-2). The cleared area to the south also contains an unidentified structure. It is unknown whether this structure was built before or after 1945. The 1945 training map indicates an area of about 240 by 400 feet. These areas are just large enough for practicing the firing of rifle grenades, but would not be large enough to meet the guidelines for firing live rifle grenades.

Housing was constructed between 1957 and 1959. Prior to construction, grading of the area was completed.

3.24E.5.3 Potential Sources and Location of OE

Based on the review of historical data, OE that may be present at Site OE-24E could include rifle-fired smoke grenades. Additional information on the M22 and M23 series smoke grenades is presented in Attachment 24E-A2. Inert practice rifle grenades may have been used at this site. These would not, however, present a safety risk because the only live components associated with inert practice rounds that could be present are the blanks required to launch the round. Rifle-fired grenades by design are non-penetrating items and if present at this site would typically be found on or near the ground surface; however, it is possible that OE could be below the surface in areas of the site that were graded prior to construction. Because the Fitch Park housing area has been present at this location since 1959 it is unlikely that surface OE is present at this site.

3.24E.5.4 Potential Exposure Routes

This site is within a military housing area constructed in 1959 (Fitch Park). It is unlikely that rifle grenades are still present at the surface of the site because they would have been likely to be discovered and removed during site development, although this is not documented, or during the 40 plus years the area was occupied by families. Any devices that may exist are likely to be below the ground surface. Because no OE were discovered during sampling or reported previously, OE is not expected in this area. However, because this site was graded prior to construction of the housing, it is possible although unlikely that OE (smoke grenades) could be present below the ground surface. Future construction workers could come in contact with OE during excavation activities.

For each of the OE items potentially remaining at the site, the following discussions provide information on: (1) how the item was designed to function, (2) the likelihood the item would function if found onsite

and handled, and (3) the type of injury the item could cause if it functions. Additional information on these items is provided in Attachment 24E-A2.

Grenade, Rifle, Smoke, Colored: M22 and M22A2. The grenade, rifle, smoke M22 and M22A2 (green, red, violet, and yellow) was designed for signaling and laying smoke screens. The M22 and M22A2 consist of three basic parts: a steel stabilizer assembly, an integral fuze and a body. The fuze is a mechanical impact-igniting type. The body is filled with a burning-type smoke charge that contains a dye to color the smoke. The surfaces of the smoke charge within the body are coated with a starter mixture charge to facilitate ignition. A nose-closing plug covers a small opening or air hole in the nose of the ogive. After being fired from a rifle equipped with a grenade launcher, it was functioned by impact with the ground or other hard target, causing the firing pin to strike the primer (like a small arms primer), which ignites the starter mixture charge, and in-turn starts the smoke charge to burn. The smoke charge, consisting of baking soda, potassium perchlorate, sugar, and dye, burns for approximately 60 seconds (*Army, 1994; Navy, 1947*). These would be very difficult to cause to function by incidental contact. They would have to be thrown against a hard surface, hard enough for the firing pin to overcome the anti-creep spring and strike the primer. If caused to function, the type of injuries that could be sustained would be burns from the burning smoke charge.

Summary: It is unlikely that a person could cause a smoke grenade to function through casual contact if one were found at the site and be burned, because the grenade: (1) was designed to be functioned by a hard nose-on impact with the ground or other hard target, and (2) would have been exposed to moisture, degradation, and weathering for many years, which could decrease the effectiveness of the components that cause it to function.

Grenade, Rifle, Smoke, Colored, Streamer: M23 and M23A1. The grenade, rifle, smoke, streamer M23 and M23A1 (green, red, violet, and yellow) was designed for signaling with colored streamers. The M23 and M23A1 are almost identical to the M22 and M22A2 described above. The M23 series contain approximately 6.4 ounces of smoke composition. Upon being fired from the rifle, the gas from the grenade cartridge passes from the rifle through orifices in the fuze to ignite the ignition charge in the fuze. The ignition charge in-turn ignites the mixture charge, and the mixture charge then ignites the smoke charge. The smoke charge begins to burn, and during flight, air passing through the air hole in the nose of the grenade forces smoke out the holes in the base of the grenade producing streamers of colored smoke. The smoke charge burns for approximately 12 seconds (*Army, 1994*). There are no moving parts in the fuze that would be subject to mechanical forces to ignite. Because the ignition charge requires flash from the rifle bore to ignite, the M23 and M23A1 would be difficult to cause to function by incidental contact. The rifle grenade would have to be placed in a fire to receive the heat/flash necessary to start the ignition process.

Summary: It is unlikely that a person could cause a smoke grenade to function through casual contact if one were found at the site and be burned, because: (1) there are no moving parts in the fuze that could cause it to ignite if handled, (2) the grenade would have to be placed in a fire to receive the heat/flash necessary to start the ignition process, and (3) the ignition components would have been exposed to moisture, degradation, and weathering for many years, which could decrease their effectiveness.

3.24E.6 Site Evaluation

The available data (e.g., archival and sampling data) regarding Site OE-24E were reviewed and evaluated according to procedures described in the *Final Plan for Evaluation of Previous Work (HLA, 2000)*. The evaluation process is documented through the completion of a series of checklists. Copies of the checklist are provided as Attachment 24E-A1. This section presents a summary of the results of the checklist

evaluation. It is divided into two sections, an assessment of the literature review, and an assessment of the sampling performed at the site.

3.24E.6.1 Literature Review

Type of Training and OE Expected

According to training maps, Site OE-24E was used as a Practice Rifle Grenade training area in the 1940s and possibly in the 1950s. A 1956 map shows this area was referred to as Squad Patrol Area. Literature evidence indicates this area was not used as an impact area for high explosive items. It is possible that pyrotechnic items could have been used during training.

Subsequent Use of the Area

Subsequent use of this area was for military housing. Review of grading maps indicates that this area was graded prior to construction. Grading plans indicate that both cut and fill areas were present in the OE-24E area. It is anticipated that any OE found during construction of housing in the late 1950s would have been removed; however, this is not documented. After construction of the housing, the closest training areas were located south within the MRA.

Establishment of Site Boundaries

Review of historical aerial photographs and training maps indicates that the Practice Rifle Grenade area (OE-24E), as digitized from the 1945 training map, is located within the current Site OE-24D boundaries. The Site OE-24E boundaries encompass a part of the northern cleared area that is evident on the 1951 aerial photograph. The remaining portion of this cleared area is located outside of the OE-24E boundaries.

Summary of Literature Review Analysis

Based on a review of site literature, there was sufficient historical evidence to warrant sampling of this site. Historical training maps show that this site was used as a Practice Rifle Grenade training area in the 1940s. There is evidence that the training area may have extended to the south to the disturbed areas visible on aerial photographs from 1951.

3.24E.6.2 Sampling Review

This section describes the items that were found during sampling and the types of fillers that would be used in the items. The review included a comparison of sampling locations relative to site boundaries, a review of the equipment used during sampling, a discussion of the sampling methods used, and the quality control measures used during the investigation.

Sampling Results (Items Found)

Sampling was conducted at Site OE-24E in 1997. SS/GS sampling was conducted on three sample grids. One fragment was identified during sampling at a depth of 4 inches; however, the type of fragment was not specified (Table 24E-2). Because only one piece of frag was identified, it is not likely that the area was an impact area. In addition, the area is labeled on training maps as "Practice Rifle Grenade". The practice rifle grenade available for use during the mid-1940s was an inert item that contained no explosive charge (Hogg, 2001). No evidence of pyrotechnic items such as rifle smoke grenades was found during

sampling at this site. Non-OE scrap identified during sampling includes nails, rocks, wire, magnets, and a spoon. These items would be expected in a housing area.

Site Boundaries Review

The three sample grids appear to cover a portion of the cleared area present on the 1951 aerial photograph. The grids do not fall within the site boundaries digitized from the 1945 training map; however, grids from adjacent site OE-24D do fall within these digitized boundaries. One unidentified fragment was discovered at 6 inches below ground surface (bgs) during sampling at OE-24D. Because no OE items were identified during sampling and sampling was conducted in the area identified as the Practice Rifle Grenade training area, no changes to the boundary are warranted.

Equipment Review

CMS used the Schonstedt Model GA-52/Cx to conduct the geophysical investigations at each grid. This magnetometer is hand held and swung from side to side, which generates a maximum search lane of 5 feet. The Schonstedt instruments are passive dual flux-gate magnetometers -- highly sensitive magnetic locators that detect ferrous (iron) metal objects; however, they cannot detect non-ferrous metal objects (e.g., lead, brass, copper, aluminum). Magnetometers make passive measurements of the earth's natural magnetic field; ferrous metal objects (and rocks) are detected because they produce localized distortions (anomalies) in the magnetic field. The Schonstedt magnetometers actually detect slight differences in the magnetic field (the "gradient") by means of two sensors mounted a fixed distance apart within the instruments' staff. Because the magnetic response falls off (changes) greatly even over a short distance, a gradient magnetometer like the Schonstedt GA-52/Cx is especially sensitive to smaller, near-surface ferro-metal objects (*Breiner, 1973*).

The performance of the Schonstedt GA-52/Cx was evaluated as part of the Ordnance Detection and Discrimination Study (ODDS, *Parsons Infrastructure & Technology Group, Inc. [Parsons], 2001*). As part of the ODDS, studies were performed to evaluate:

- Signatures of inert OE items suspended in air at varying orientations and distances from the geophysical sensor (static tests)
- The ability of various geophysical instruments to detect and discriminate between different OE items buried at various depths (seeded tests).
- Geophysical instrument performance at actual OE sites (field trial site testing).

The Schonstedt tools were not evaluated during the static tests. Therefore, only the seeded test results and the field trials are discussed here. It is recognized that the ODDS study areas may not represent the same field conditions as Site OE-24E; therefore, differences in field conditions, if applicable, should be considered when using information from the ODDS.

During the seeded test, the Schonstedt Model GA-52/Cx detected between 64 and 85 percent of Type II items (type II items included the M9 rifle grenade) buried up to 1 foot below the calculated penetration depth. The detection rate percentages presented in the ODDS vary according to the search radius used for the analysis (either 1.6 or 3.3 feet), and assume a 5-foot wide search lane (the search lane width used by CMS at Site OE-24E). A standard search radius for investigating anomalies was not specified in the OE contractor work plan or the after action report; therefore detection "ranges" based on the two search radii (1.6 or 3.3 feet) are presented above. Results for the 3-foot wide search lane, also evaluated as part of the ODDS, were not included in the detection percentages presented above, because 3-foot wide search lanes

were not used during the geophysical investigation of Site OE-24E. The detection rates discussed above are considered conservative because an additional 1 foot was added to the items' calculated penetration depth to allow for soil deposition over time. Because the field conditions at the seeded test site and orientations of buried items may not be comparable to the Site OE-24E conditions, the results should be used to indicate that in general, the equipment is capable of detecting the same types of items.

Results of the ODDS field trail tests were also reviewed for potential use in evaluating instrument performance at Site OE-24E. Detection ranges for the Schonstedt Model GA-52/Cx were calculated for 4 of the 6 test sites; the remaining sites did not have enough OE detected to allow calculation of site statistics. The calculated detection rates for the combined sites ranged from 97 to 99 percent depending on the search radius used for the calculation. A standard search radius for investigating anomalies was not specified in the OE contractor work plan or the after action report; therefore detection "ranges" based on the two search radii (1.6 and 3.3 feet) are presented above. It should be noted that the ODDS field trial sites were selected to represent areas with high ordnance density. In comparison, Track 1 sites are expected to have very low densities of OE scrap. Therefore, the field trail results may not be applicable to Track 1 sites.

Results of the ODDS field trials for the field test site FTS-3, which has an OE density most like Site OE-24E, were also reviewed. Five OE scrap items were located at FTS-3 and no additional OE items were found during sifting of 10 percent of each grid. This result indicates that it is unlikely that OE items would remain at FTS-3. Similar results could be expected at other sites (such as OE-24E) after survey and clearance using a Schonstedt GA-52/Cx.

Although not directly comparable to Site OE-24E, the results of the ODDS indicate that all models of the Schonstedts used at this site are capable of detecting the ferrous surface and subsurface OE expected at this site. Blank ammunition is non-ferrous and cannot be detected with a magnetometer.

Sampling Methods Discussion

SS/GS sampling methodologies were used at this site. SS/GS is a computer program used to statistically estimate the ordnance density of a site or grid during field investigations. It estimates the number of ordnance items at a given site or grid and can be used to assess whether a site has been characterized adequately. This program was designed so that there were equal chances of finding OE and non-OE items. Excavation of anomalies identified with a magnetometer is performed in accordance with direction of the program; generally 32 to 40 percent of the flagged anomalies are investigated using this technique (CMS, 1995). The SS/GS methodology was reviewed by the EPA's Federal Facilities Restoration and Reuse Office. The Technical Support Center, EPA National Exposure Research Laboratory (NERL) in Las Vegas, Nevada also provided statistical assistance in reviewing the SS/GS methodology. Several problems were identified as a result of the review. The primary conclusions were: 1) the statistical procedures are vague and not well documented, 2) conclusions about site homogeneity are not consistent, 3) the stopping rules are faulty and 4) the program was not able to identify UXO clusters at a site. Although these problems were identified, the information obtained during sampling is useful in identifying the presence of and type of OE present at the site.

Three sample grids were sampled at Site OE-24E (total of 12,500 square feet). The three grids were non-standard sized due to terrain and structures within the site. One of the three sample grids was established outside of the site boundary and with non-standard dimensions due to terrain and structures within the site. A total of 434 anomalies was identified and 160 were excavated. All excavated anomalies were pursued until a metallic item was discovered or to a depth of 4 feet (USA, 2000). Items at this site were found between 2 and 16 inches bgs. As noted above no OE was identified; however, one unidentified

fragment was found. Because no OE items were discovered at the excavated anomalies, the expected number of OE items calculated by the SS/GS program is zero.

Quality Assurance/Quality Control

Field Sampling

Throughout the operations at Site OE-24E, the contractor performed daily operational checks and Quality Control (QC) inspections of the SS/GS work done on this site (*USA, 2000*). QC was performed throughout the field sampling and is documented in the after action report (AAR) (*USA, 2000*). The USACE also performed Quality Assurance (QA) inspections of the work. Because of the nature of the SS/GS sampling, QA/QC was limited to inspections of operational activities and documentation. No deficiency reports were written during inspections. In accordance with the USA/CMS work plan, all instruments requiring maintenance and/or calibration were checked prior to the start of each workday. Batteries were to be replaced as needed and the instruments were to be checked against a known source. The QC specialist was responsible for ensuring that personnel perform operational checks and maintain appropriate log entries. The QC specialist also was to perform random unscheduled checks of the various sites to ensure that personnel perform the work as specified in the work plan.

Data Management

Parsons, the current OE contractor, performed a 100 percent QC review of the data associated with this site. This review followed the guidelines presented in the Standard Operating Procedures (SOPs) provided as Appendix A. This review included review of the SS/GS records, review of the field grid records, and review of the database created by the OE contractor. The USACE followed the QC review with a 10 percent QA review of Parsons' data review. The requirements of the QA review are described in the SOP provided as Appendix B in this report. The purpose of the QC/QA review was to complete a 100 percent check of all available grid records to identify discrepancies between the after action report and the grid records. Discrepancies were then researched and corrections made, if appropriate, prior to loading the data into the project database. No discrepancies between the after action report and the grid records were identified for this site.

For this site, the following conclusions can be made regarding the quality of the data:

For this site, the following conclusions can be made regarding the quality of the data:

- There was coordinate and depth information concerning the scrap OE items found
- The data collected are useful in providing information concerning the type of OE items present at the site
- Because some anomalies were not excavated using the SS/GS investigative approach, some OE scrap may still be present within the sampling grids
- Because only one OE scrap item was found through the investigation of 160 randomly selected anomalies out of 434 total, it is reasonable to assume that the remaining anomalies are also not OE.
- The SS/GS sampling has problems in that there have been some issues raised concerning the statistical methods used (*NERL, 2001*).

3.24E.7 Conclusions and Recommendations

The following section presents conclusions and recommendations for Site OE-24E based on the review and analysis of the data associated with review of historical information and data gathered during sampling activities.

3.24E.7.1 Conclusions

Site Use and Development

- Historical records indicate that this site was used as a practice rifle grenade range in the 1940s. No evidence of this use was discovered during sampling at the site.
- The training area appears to extend to the south to the disturbed areas shown in the 1951 aerial photograph; however, the current boundaries and grid locations encompass most of the disturbed area.
- Subsequent use of this area as military housing suggests that live items associated with 1940s use as a practice rifle grenade range should have been removed during the construction of the housing, if encountered.
- Review of grading plans for the housing development and aerial photographs taken after development of the housing indicates that the site was filled/cut prior to completion of the housing.
- No incidental OE finds of 1940s era ordnance are documented in this area.

Sampling Adequacy and Data Quality

- The Schonstedt Model GA-52/Cx was used for all geophysical investigations. This instrument was evaluated as part of the ODDS and is capable of detecting the types of rifle grenades expected at this site. A numerical value for the probability of detection of OE items at this site cannot be calculated for an individual site.
- The sampling methodology for this site was SS/GS. SS/GS sampling is useful in identifying the presence of OE at a site, if it is encountered. Because problems with the statistics have been identified, it cannot be used to evaluate the adequacy of the sampling conducted.
- Sampling and evaluation of previous work followed published work plans and SOPs.
- Based on historical use of the site, subsequent reuse as residential housing, and materials found at the site, it is unlikely OE is present at the site. However, the following OE items, if present at the site, are considered to pose an acceptable risk if encountered for the following reasons:

Grenade, Rifle, Smoke, Colored: M22 and M22A2. It is unlikely that a person could cause a smoke grenade to function through casual contact if one were found at the site and be burned, because the grenade: (1) was designed to be functioned by a hard nose-on impact with the ground or other hard target, and (2) would have been exposed to moisture, degradation, and weathering for many years, which could decrease the effectiveness of the components that cause it to function.

Grenade, Rifle, Smoke, Colored, Streamer: M23 and M23A1. It is unlikely that a person could cause a smoke grenade to function through casual contact if one were found at the site and be burned,

because: (1) there are no moving parts in the fuze that could cause it to ignite if handled, (2) the grenade would have to be placed in a fire to receive the heat/flash necessary to start the ignition process, and (3) the ignition components would have been exposed to moisture, degradation, and weathering for many years, which could decrease their effectiveness.

Although the previous OE sampling efforts performed at Site OE-24E are not consistent with requirements in place today, the quantity and quality of the available information is sufficient to make an informed decision regarding the site. The entire site was not sampled, however, the sampling methods were sufficient to confirm the types of OE items used. Additionally, because the OE items used at Site OE-24E pose an acceptable risk if encountered, and there was no OE found in previous investigations at Site OE-24E, further effort to refine the site boundaries or conduct 100 percent sampling of the site would not add significantly to the understanding of the site or change the conclusions of this report.

3.24E.7.2 Recommendations

Based on the review of existing data:

- It is not anticipated that OE will be found at Site OE-24E and no further OE-related investigation is recommended. However, because OE were used throughout the history of Fort Ord, the potential for OE to remain at Site OE-24E cannot be ruled out.
- This site qualifies as a Track 1, Category 3 site because it was used for training. OE items that potentially remain pose an acceptable risk based on site-specific evaluations conducted in the RI/FS.
- No further OE-related investigation is recommended.

The U.S. Army Corps of Engineers completed ordnance investigations at Site OE-24E. The Army, with regulatory oversight from the U.S. Environmental Protection Agency (USEPA) and the California Department of Toxic Substance Control (DTSC), conducted a systematic investigation and no explosive material was found. The investigation was specifically designed to assess the nature of the past military training activities at the site. Even though no actionable risk was identified through the remedial investigation process, in the interest of safety the Army recommends reasonable and prudent precautions be taken when conducting intrusive operations at the site. Construction personnel involved in intrusive operations at the site should attend the Army's "ordnance recognition and safety training" to increase their awareness of and ability to identify OE items. Trained construction personnel will contact an appropriate local law enforcement agency if a potential OE item is encountered. The local law enforcement agency will arrange a response by the Army. To accomplish that objective, the Army will request notice from the landowner of planned intrusive activities, and in turn will provide ordnance recognition and safety training to workers prior to the start of intrusive work. Additionally, while these intrusive activities are ongoing, the Army will conduct weekly site visits and provide refresher education as appropriate.

Upon approval of the proposed remedy for Site OE-24E (no further OE-related investigation), Site OE-24E will be incorporated into the Basewide OE RI/FS 5 year review schedule. The purpose of the "5-year review" is to determine whether the remedy at Site OE-24E continues to be protective of human health and the environment. The 5-year review will also document any newly identified site-related data or issues identified during the review, and will identify recommendations to address them as appropriate. At the time of the next 5-year review, the Army will assess whether the education program should continue. If experience indicates that no explosive items have been found in the course of development or redevelopment of the site, it is anticipated that the education program may, in consultation with the

regulatory agencies, be discontinued, subject to reinstatement if an explosive item is encountered in the future.

3.24E.8 References

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TABLES

**Table 24E-1. Sampling Operations, Site OE-24E
Track 1 Ordnance and Explosives Remedial Investigation/Feasibility Study
Former Fort Ord, California**

Site	Grid ID	Operation Type	Contractor	Geophysical Instrument Used	Grid Completion Date
OE-24E -- Practice Rifle Grenade Range	OE-24E_01 E	SS/GS	USA	SCHONSTEDT GA-52CX	5/1/1997
OE-24E -- Practice Rifle Grenade Range	OE-24E_02 E	SS/GS	USA	SCHONSTEDT GA-52CX	5/1/1997
OE-24E -- Practice Rifle Grenade Range	OE-24E_03 E	SS/GS	USA	SCHONSTEDT GA-52CX	5/1/1997

Site = OE Site Number

Grid ID = only the portion of the Grid ID within parenthesis is posted on Plate 24E-4.

SS/GS = Sitestats/Gridstats sampling performed, selected anomalies were excavated.

USA = USA Environmental

Grid Completion Date = Work may have been conducted within a particular grid on more than one date.

**Table 24E-2. OE Scrap Found During Sampling, Site OE-24E
Track 1 Ordnance and Explosives Remedial Investigation/Feasibility Study
Former Fort Ord, California**

Site or Area	Grid ID	OE Items	Status	Depth (in)	Quantity
OE-24E -- Practice Rifle Grenade Range	OE-24E (01 E)	UNKNOWN MODEL: FRAGMENTS, UNKNOWN (OE Model Unknown)	Inert	Not available	1

Site = OE Site Number

Grid = Grid in which item was found.

Status = Condition of item, either live or inert. Inert indicates no OE hazard (OE scrap).

Depth = inches below ground surface that item was found.

Quantity = Number of like items found.

PLATES

Disclaimer

The following plates have been prepared to present pertinent features digitized from historical training maps and scanned aerial photographs. It should be noted that minor discrepancies between source maps, combined with the natural degradation of older source maps and photographs, has resulted in misalignment of some map features. In addition, camera angle and lens distortion introduced into older aerial photographs, combined with changes in vegetation and site features over time may contribute to misalignments of some map features with respect to the aerial photographs.

ATTACHMENT

24E - A1

ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SITE 24E
LITERATURE REVIEW

Yes No Inconclusive

TYPE OF TRAINING AND OE EXPECTED

1. Is there evidence that the site was used as an impact area (i.e., fired OE such as mortars, projectiles, rifle grenades or other launched ordnance)?

Yes		
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Sources reviewed and comments

This OE site was identified as "Practice Rifle Grenade" on a 1945 Training Facilities map. The site is in an area that includes Booby Trap, Practice Hand Grenade, Live Grenade and a second Practice Rifle Grenade training areas, as identified on the 1945 Training Facilities map and 1946 Master Plan. This site is not identified on available training maps after 1946 (e.g., Circa 1954 map or after).

2. Is there historical evidence that training involved use of High Explosive (HE) or Low Explosive (LE) items?

	No	
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Sources reviewed and comments

No evidence to support the use of HE or LE in this area. Revised Archives Search Report (ASR), USAEDH 1997; Review of Fort Ord facilities and training maps.

3. Is there historical evidence that training involved use of pyrotechnic and/or smoke producing items (e.g., simulators, flares, smoke grenades) but not explosives?

		Inconclusive
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Sources reviewed and comments

Its possible based on the historical use of the site that rifle smoke grenades and simulators may have been used. If the site was used at night then flares may have been used (USAEDH, 1997).

**ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SITE 24E
LITERATURE REVIEW**

Yes No Inconclusive

DEVELOPMENT AND USE OF THE SURROUNDING AREA

4. Does subsequent development or use of the area indicate that OE would have been used at the site?

	No	
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Sources reviewed and comments

Housing was constructed in this area in the early 1960s (USACE, 1959).

5. Does use of area surrounding the site indicate that OE would have been used at the site?

		Inconclusive
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Sources reviewed and comments

Area is bordered by old North South Road and is adjacent to a Booby Trap training area. Other training areas nearby include a Live Grenade, Practice Rifle Grenade, and Practice Hand Grenade. To the south is the multi-range area, to the west a training area (which in the early 1950s became a golf course) and to the north OE sites (Site OE-39 and OE-49) and development. The training area to the west does not have any OE sites within. Only one OE scrap item was found in the sampling of the adjacent "Booby Traps" training area. Nothing was found in the sampling of Site OE-39 to the north. Site OE-49 has not been sampled. A site walk of OE-49 found no evidence of OE use.

ESTABLISHMENT OF SITE BOUNDARIES

6. Is there evidence of training areas on aerial photographs that could be used to establish

		Inconclusive
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Sources reviewed and comments

Cleared/disturbed areas are visible in this location on the 1941 and 1951 aerials. This area looks approximately the same in the 1956 aerial as well. The cleared areas may have been used for training.

**ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SITE 24E
LITERATURE REVIEW**

7. *Is there evidence of training on historical training maps that could be used to establish boundaries?*

Yes	No	Inconclusive
Yes		

Sources reviewed and comments

Boundary defined on the 1945 Training Facilities Map and the 1946 Master Plan.

8. *Should current boundaries be revised?*

	No	
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Sources reviewed and comments

Boundaries could be modified; however, sampling was completed in the areas identified as the training area, so it is not necessary to modify the boundaries.

RESULTS OF LITERATURE EVALUATION

Does the literature review provide sufficient evidence to warrant further investigation?

Yes		
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Comments

Results of the literature review indicate that the site was used for practice rifle grenade training in the 1940s. Based on this use, sampling was recommended and completed. Review of the sampling results is provided in the Sampling Evaluation checklist.

References

USAEDH, 1997. Revised Archives Search Report, Former Fort Ord, California, Monterey County, California. Prepared by US Army Corps of Engineers St. Louis District.
Training Facilities Map, Revised August 1945
Master Plan - Fort Ord, April 5, 1946
Training Areas That Cannot Be Used at the Same Time, Circa 1954
Field training Areas and range Map, April 27, 1964.
1941 and 1951 aerial photos
USACE, 1959, Fort Ord Aerial Photo Contour Map, Main Garrison

**ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SAMPLING EVALUATION**

Yes No Inconclusive

1. Is there evidence that the site was used as an impact area (i.e., fired OE such as mortars, projectiles, rifle grenades and other launched ordnance)?

Yes		
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Sources reviewed and comments

Labeled on training map as "Practice Rifle Grenade." One scrap fragment was found during sampling. The scrap fragment was not identified (USAEDH 1997; Review of Fort Ord facilities and training maps; USA, 2000).

2. Is there evidence that training involved use of High Explosive (HE) or Low Explosive (LE) items?

		Inconclusive
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Sources reviewed and comments

Only 1 unidentified OE scrap (frag) item was found during sampling (USA, 2000). The frag could indicate use of LE or HE items.

3. Is there evidence that training involved use of pyrotechnic and/or smoke producing items (e.g., simulators, flares, smoke grenades) but not explosives?

	No	
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Sources reviewed and comments

Only 1 unidentified scrap item was found during sampling (USA, 2000).

4. Was sampling and/or reconnaissance performed within the appropriate area?

Yes		
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Sources reviewed and comments

The three sample grids appear to be within a 1940s era disturbed area (USA, 2000). Grids sampled as part of Site OE-24D cover the southern disturbed area.

5. Does sampling indicate OE and/or ordnance-related scrap are present at the site?

Yes		
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Sources reviewed and comments

1 unidentified scrap item (frag) was found during sampling (USA, 2000).

**ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SAMPLING EVALUATION**

	Yes	No	Inconclusive
6. Were the type(s) of items found consistent with the type of training identified for the site?			Inconclusive

Sources reviewed and comments
Only one scrap item (frag) was found and it is not unidentified (USA, 2000).

7. Were the type(s) of items found consistent with the era(s) in which training was identified?			Inconclusive
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Sources reviewed and comments
Scrap item (frag) was unidentified (USA, 2000).

8. Was HE fragmentation found?			Inconclusive
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Sources reviewed and comments
Scrap item (frag) was not identified (USA, 2000).

9. Was HE found?		No	
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Sources reviewed and comments
No HE found (USAEDH 1997; USA, 2000).

10. Were LE found?		No	
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Sources reviewed and comments
No LE found (USAEDH 1997; USA, 2000).

11. Were pyrotechnics found?		No	
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Sources reviewed and comments
No pyrotechnics found (USAEDH 1997; USA, 2000).

12. Were smoke producing items found?		No	
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Sources reviewed and comments
No smoke producing items found (USAEDH 1997; USA, 2000).

**ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SAMPLING EVALUATION**

	Yes	No	Inconclusive
13. Were explosive items found (e.g. rocket motors with explosive components, fuzes with explosive components)?		No	

Sources reviewed and comments
1 unidentified scrap item (frag) was found during sampling (USA, 2000).

14. Do items found in the area indicate training would have included use of training items with energetic components?			Inconclusive
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Sources reviewed and comments
The frag could indicate use of items with energetic material. USAEDH 1997; USA, 2000

15. Were items found in a localized area (possibly the remnants of a cleanup action)?		No	
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Sources reviewed and comments
One unidentified fragment was found during sampling (USA, 2000).

16. Has the site been divided into sectors to focus on areas of common usage, similar topography and vegetation, and/other unique site features?		No	
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Sources reviewed and comments
Site was not divided into sectors. The boundaries were established based on historical documentation and site visits (USA, 2000).

17. Should current site boundaries be revised?		No	
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Sources reviewed and comments
Boundary appears to be in approximately the correct location based on the aerial photograph (1951 aerial photo). However, the 1945 map shows the location to the southeast within OE-24D boundaries. Sampling results do not indicate the boundaries should be revised.

**ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SAMPLING EVALUATION**

	Yes	No	Inconclusive
18. Was equipment used capable of detecting items suspected at the site at the maximum expected depth?	Yes		

Sources reviewed and comments
All anomalies were pursued until an item was recovered or to a depth of 4 feet. Rifle grenades penetrate to a depth of 0.1 feet in sand (USAESCH, 1997).

19. Was equipment used capable of detecting the types of items (e.g., non-ferrous) suspected at the site?	Yes		
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Sources reviewed and comments
The practice rifle grenade and smoke grenades contain ferrous material and should be detected.

20. Do the results of the ODDS indicate that items suspected at the site would have been detected by the instrument used at the time of investigation?			Inconclusive
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Sources reviewed and comments
The M9/M11 Rifle grenades were buried as part of the seeded test and are classified as (practice) listed as Type II items in the ODDS (USA, 2000). Instrument listed in the after action report is the Schonstedt GA-52/Cx. The results of the ODDS indicate that the Schonstedt GA-52/Cx is capable of detecting the ferrous OE suspected at this site (USA, 2000, CMS, 1997).

21. Do results of the investigation indicate that suspected items could be detected with a high level of confidence at observed and expected depth ranges?	Yes		
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Sources reviewed and comments
Yes. The items used at the site would be expected to penetrate 0.1 feet in sand (USAESCH, 1997). However, if the items were buried then confidence level would decrease.

22. Were all the instruments used to evaluate the site maintained and calibrated in accordance with associated work plan and manufacturer's specifications?	Yes		
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Sources reviewed and comments
Throughout operations at Site OE-24E CMS performed daily operational checks and Quality Control (QC) inspections of its work (USA, 2000)

**ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SAMPLING EVALUATION**

Yes No Inconclusive

23. Based on the anticipated target density (UXO items per acre) has the minimal amount of sampling acreage been completed in accordance with the scope of work or contractor work plan?

		Inconclusive
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Sources reviewed and comments

SiteStats/GridStats was used to design and implement sampling at this site. Subsequent to this work, the use of this program has been questioned. It appears that the data are of good quality; however, it is not possible to statistically evaluate the adequacy of the sampling of this site.

24. Based on sampling procedure (e.g., grids, transects, and/or random walks) was a percentage of the site completed to provide 95% confidence in a UXO density estimate, and if so provide total area investigated and the UXO density estimate.

		Inconclusive
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Sources reviewed and comments

12,500 square feet (approximately 0.29 acres) sampled by CMS based on 3 non-standard sized grids (two 5,000 and one 2,500 square feet) due to terrain and structures within the site. One of the three grids was established partially outside of the Site OE-24E boundary due to terrain and structures within the site (USA, 2000). It is not possible to estimate OE density because no OE was found.

Total Area:	12,500 sq ft
UXO Density:	Not Applicable

25. What percentage of the anomalies were intrusively investigated?

Total % of anomalies investigated:	32%
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Sources reviewed and comments

434 anomalies identified and 160 excavated or 32% (USA, 2000)

26. Was the appropriate data processing scheme used for the site, how was the data processed?

	Not Applicable
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Sources reviewed and comments

Not applicable, no digital geophysical data were collected.

**ATTACHMENT 24E - A
EVALUATION OF PREVIOUS WORK: SITE OE-24E
EVALUATION CHECKLIST: SAMPLING EVALUATION**

	Yes	No	Inconclusive
27. Has the field data been collected and managed in accordance with quality control standards established for the project?	Yes		

Sources reviewed and comments

The grids which were sampled in Sites OE-24E were not subject to formal Quality Control (QC) inspections because of the nature of the SiteStats/GridStats procedures. Throughout operations at Site OE-24E CMS performed daily operational checks and QC inspections of its work. No deficiency reports were written during inspections of the SiteStats/GridStats sampling work done on this site (USA, 2000).

Result of Sampling Evaluation

Does the sampling evaluation provide sufficient evidence to warrant further investigation?		No	
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Comments

Based on the review of existing site data, it is not anticipated that OE would remain at this site and no further OE-related investigation is warranted; however, because the site was used as a practice rifle grenade area, the presence of practice rifle grenades at the site cannot be ruled out.

References

Report SiteStats/GridStats OE Sampling, Inland Range Contract, Former Fort Ord, California, Site 24B-E And OE-39. December 30.
 USAEDH, 1997. Revised Archives Search Report, Former Fort Ord, California, Monterey County, California. Prepared by U.S. Army Corps of Engineers St. Louis District.
 Parsons, 2001. Ordnance Detection And Discrimination Study, Former Fort Ord, California, December.
 USAESCH, 1997. Penetration of Projectiles Into Earth, An Analysis of UXO Clearance Depths at Ft. Ord. September 10. Appendix F of the Phase 2 EE/CA.

ATTACHMENT 24E-A2

ATTACHMENT 24E-A2

POTENTIAL ORDNANCE USED AT SITE OE-24E

Rifle Grenades, Smoke, Green, Red, Violet, or Yellow, M22 and M22A2- The information provided below is from TM 43-001-29, Army Ammunition Data Sheets for Grenades (*Army, 1994*) The M22 series of rifle grenade are /were used for signaling and laying smoke screens. The M22 and M22A2 consist of three basic parts: a steel stabilizer assembly, an integral fuze and a body. The body is filled with a burning-type smoke charge, a mixture of baking soda, potassium perchlorate, and sugar, which contains a dye to color the smoke. The surfaces of the smoke charge within the body are coated with a starter mixture charge to facilitate ignition. A small opening or air hole in the nose of the ogive is covered by a nose closing plug.

Colored smoke rifle grenades M22 and M22A2 function on impact, emitting a cloud of colored smoke for approximately one minute. After being fired from a rifle equipped with a grenade launcher, these grenades function as follows: The grenade ogive strikes the ground or other resistant object. Inertia of the firing pin overcomes spring tension and the firing pin strikes the primer. The primer emits a small, intense spit of flame. Flame from the primer ignites the starter mixture charge. The burning starter mixture charge ignites the smoke charge. The smoke charge burns for approximately 1 minute, emitting a dense cloud of colored smoke through holes in the base of the body.

Rifle Grenades, Smoke, Green, Red, Violet, or Yellow, Streamer, M23 and M23A1 – The information provided below is from TM 43-0001-29, Army Ammunition Data Sheets for Grenades (*Army, 1994*).

The M23 and M23A1 grenades are used only for signaling purposes. They produce green, red, violet, or yellow smoke streamers. The M23 and M23A1 consist of three basic parts: a steel stabilizer tube assembly, a fuze and a body. The body is filled with a burning type smoke charge, which contains a mixture of baking soda, potassium perchlorate, sugar and a dye to color the smoke. The surfaces of the smoke charge within the body are coated with a starter mixture charge (to facilitate ignition). A small air hole opening in the nose of the ogive is covered by a piece of tape (to protect the filler against moisture). The tape must be removed prior to firing. Colored smoke streamer rifle grenades M23 and M23A1 function on firing emitting a stream of colored smoke over the entire trajectory. Upon firing the grenade cartridge in the rifle, these grenades are launched and function as follows: Flash from the grenade cartridge passes from the rifle through orifices in the fuze to ignite the igniting charge in the fuze. The igniting charge ignites the starter mixture charge. The starter mixture charge ignites the smoke charge. The smoke charge begins to burn, generating colored smoke. Air entering the air hole in the nose of the grenade forces smoke out holes in the base of the body, producing streamers of colored smoke. The smoke charge continues to burn producing smoke over the entire trajectory of the grenade, and for a few seconds after striking the ground (Total burning time about 12 seconds).